IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of	
ERHAN GUVEN et al	Group Art Unit 2616
Application No. 09/750,264	Examiner: Levitan, Dmitry
Filed: December 29, 2000	Atty. Dkt. No. TI-32148
For: MODEM RELAY PROTOCOL REDUNDANCY FOR RELIABLE LOW SPEED MODEM COMMUNICATIONS OVER IP NETWORKS WITH SUBSTANTIAL PACKET LOSS	

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

TRANSMITTAL OF APPELLANT'S BRIEF

Transmitted herewith is the Appellant's Brief on Appeal in this application.

The Commissioner is hereby authorized to charge the filing fee in the amount of $500.00 to Deposit Account 20-0668. The Commissioner is also authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 20-0668.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on March 14, 2007.

Joseph J. Zito 3-14-07

Joseph J. Zito Date

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
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In re Patent Application of	
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Application No. 09/750,264	Examiner: Levitan, Dmitry
Filed: December 29, 2000	Atty. Dkt. No. TI-32148
For: MODEM RELAY PROTOCOL REDUNDANCY FOR RELIABLE LOW SPEED MODEM COMMUNICATIONS OVER IP NETWORKS WITH SUBSTANTIAL PACKET LOSS	

APPELLANT'S BRIEF ON APPEAL

Mail Stop Appeal Brief-Patents
Commissioner for Patents
PO Box 1450
Alexandria, VA 22313-1450

Sir:

Appellant respectfully appeals the final rejection of claims 7-10 and 17-32 in the Office Action dated June 27, 2006. A Notice of Appeal was timely filed on October 12, 2006 and docketed on October 16, 2006.

I. REAL PARTY IN INTEREST

The real party in interest is Texas Instruments, having 100% interest in the above-referenced patent application.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences known to Applicant/Appellant or Appellants's legal representative which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 7-10 and 17-32 are all the pending claims in the Application, and are set forth fully in the attached Appendix.

Regarding the prior art rejections, claims 17-27 are drawn to an non-elected invention and as such are withdrawn from consideration herein. Claims 7-10 and 28-32 stand rejected under 35 U.S.C. § 112 first paragraph for failure to comply with the written disclosure requirement. The examiner has maintained that the formula [x-I]N+[x-i]N found in the claims, is not supported by the disclosure as filed.

Appellant respectfully appeals the rejections of claims 7-10 and 17-32 and appeals for allowance of these claims.

IV. STATEMENT OF AFTER-FINAL AMENDMENT

No after final amendment was filed in this matter. The Amendment of June 7, 2006 was entered by the Examiner. Therefore, the claims are pending as set forth in

the Appendix.

V. SUMMARY OF THE INVENTION

This invention relates to modem transmission over packet networks. In particular, the present invention relates to techniques for demodulating, relaying, and remodulating low speed (eg. V.22, V.22bis and V.21) modem transmissions over packet networks with a robust redundancy technique to maintain reliable communications in the event of high packet loss.

The modem relay of the present invention allows for the capability to demodulate, relay, and remodulate modem transmissions over packet networks.

The modem relay provides a local interface to the modem on both ends of the call, demodulates the full duplex data stream, packetizes the bits for transport over an IP network, and remodulates the data stream at the remote end. The modem relay provides bandwidth savings, and improved performance (data throughput and connection reliability) in a packet loss environment.

The modem relay mitigates the problems associated with using G.711 to send modem traffic. In modem relay, the physical layer or link layer of the modem signal is terminated locally for both ends of the call. Only the demodulated data stream is sent over the network. This leads to dramatic bandwidth savings. For a V.34 modem, in an exemplary embodiment, the 64 kbps phone line is demodulated into a maximum of 33,600 bps data stream. That data stream is packetized and transported with a network

bandwidth of less than 20 kbps (for 30mSec packets).

Since the physical layer is terminated locally, network packet loss will not result in any interruption in the modem signal at the receiving modem. Therefore this approach will eliminate connection failures due to the network packet loss. Instead a packet loss will result in an error in the information data stream.

Bandwidth savings are also realized using Modem Relay in that data is carried over the IP network only as the modem transmits data. When the modem is not transmitting data, no packets are sent on the IP network. In contrast, continuous 64 kbps packetization takes place when using G.711 to carry modem traffic. Depending on the network transport, the modem data is sent over the packet network using a guaranteed delivery mechanism (link layer termination) or sent using a non-guaranteed delivery mechanism (physical layer termination). In the case of a non-guaranteed delivery mechanism, data redundancy techniques can be used to combat packet loss and improve data throughput.

VI. ISSUES PRESENTED FOR REVIEW

The issues presented for review by the Board of Patent Appeals and Interferences are:

Issue 1) Whether support for claims 7, 28 and 30 is found in the disclosure as filed.

VII. GROUPING OF THE CLAIMS

All of the presently pending claims stand of fall together, as the only rejection is under §112 and applies equally to each of the three independent claims.

VIII. ARGUMENTS

The Examiner alleges that claims 7-8 are anticipated by Vargo. Vargo specifically discloses redundancy methods using single packets containing separate data segments in a series and teaches against using a series of expanding redundant data segments *within* the same packet to provide redundancy. (col. 5, 15-20).

Vargo addresses changing the packet size that would contain more data but this is only a longer, single data unit: "But while changing the packet size or bundling puts more information in each packet, changing the packet redundancy does not." Vargo specifically goes on to disclose in 5:50-6:35 using packet redundancy, not changing the packet size and not adding redundancy within the packets themselves.

The specific method of pairs of data segments for data redundancy within a packet of the claimed invention is not analogous to the multi-level packet redundancy of Vargo because Vargo claims that "an important focus of the present invention is the *particular forward error correction algorithm for providing data redundance* (col. 5, lines 4-5). As the Examiner cited, Figure 7 of Vargo represents "each box is assumed to be essentially one data packet, but for purposes of illustration each of these packets is illustrated as a letter of the alphabet." (col. 5, l. 53-55) Thus, Vargo clearly uses

repetition of *entire* single packets in the data stream. No combination of data from packets or adding multiple packets together as a single packet is disclosed nor suggested. In contrast to Vargo, the claimed invention adds redundancy by encoding multiple redundant data portions of current and preceding packets and encodes them all into one data length of a single packet. This is claimed in claims 7, 28, and 30 as

$$[x-j]N + [x-i]N$$

> where i = (0 to (k - 1)) and j = (1 to k) and each of the variables *i, j* increase by 1 in each iteration up to *k* levels of iterations that are performed for each packet.

The redundancy level is k, and the iteration of the formula is performed k levels for each single packet. Thus, each new packet's data is added to copies and redundant copies of data from previous packets in the sequence, thereby providing redundancy not only across multiple packets in the sequence but also within a single packet itself. This multi-dimensional redundancy is not taught nor disclosed in Vargo.

In the non-limiting preferred embodiment, the table on page 18 shows an illustration of this technique. In stacking the redundant data, the first packet S has only data for that packet, packet S+1 contains S+1 data and the previous S data, packet S+2 contains that packet data and all previous data segments, up to a maximum data length within a packet of kN.

As the Examiner has noted, Vargo's particular data series in Fig. 7a-d shows one data unit in each packet "T," "h," and so forth. Thus, the data buffer within each packet of Vargo does not expand with the addition of additional encapsulated data segments. The Fig. 7b does not show the claimed method. The packets drop from the paired segments immediately after the second copy of the packet is transmitted in consecutive order. Vargo's repeated packet series is clearly different and does not teach or suggest the claimed invention.

The Examiner has asserted that their is no support in the specification for the formula [x-j]N + [x-i]N recited in the claims. The examiner has mistakenly suggested that the formula cannot be derived "from the table on page 18 . . . because the table has not been properly disclosed." However, the table on page 18 was part of the original specification and therefore was properly disclosed. The Examiner has also stated that "it is unclear what portions of the packet comprise new data and what portions of the packet comprise redundant data."

Applicant has not suggested that the concept of partial redundant data comes solely from the table on page 18. The concept of partial redundant data, the essential concept of the invention, is found throughout the specification. For example on page 10:

> Redundant data. Instead of sending the same packet several times, data redundancy is achieved by appending data from previous packets in the payload section of the current data packet. Then, the receiving gateway uses the packet sequence number to determine if there has been a packet loss. If no packet loss occurred, it uses the most recent data field in the packet. If the receiving gateway

> detects that packet loss has occurred, the data fields for lost packets are retrieved by reading further down in the current packet. Data redundancy effectively increases the network bandwidth, though the actual data from the modem is a small part of the overall packet size. For instance, in a 2400bps modem with a 10mSec VIF size, the data size is 3 bytes and the header size is 48 bytes per network packet. Adding in additional 3 byte data fields will not increase the overall packet size by a significant amount based on a percentage of the total size. The amount of redundant data contained in each packet is configurable. (page 10)

It is clearly stated that the amount of redundancy is configurable, which is well within the abilities of one skilled in the art. Further parameters for the decision on redundancy are found throughout the specification.

Further, the methodology to be programed into the gateways which implement the present invention as claimed, is fully described throughout the specification. For example, on page 17:

> When packet loss exceeds a certain value, it is not possible to maintain reliable communication using the modem relay of the present invention. Therefore, data redundancy as taught herein is implemented. A whole number value k is provided as a repetition count. The value must be known by each gateway at each side of the connection and must be the same for each gateway. The value of k is negotiated by the gateways and can be dependant upon the characteristics of the packet network. A whole number N is provided as the number of new bytes in each data packet. Again, both gateways must agree on the size of the new data buffer.
>
> Each packet is encapsulated with a certain packet format including a sequence number uniquely assigned to each packet that is transmitted. The transmitting gateway receives Data [1:N] in each iteration to be encoded into the data packet. The transmitter encodes the data packets with the redundancy taught by the present invention as follows:

Thus the values for k and N can be clearly derived and applied to add the desired portion of redundancy to each packet.

Applicant respectfully submits that claims 7-10 and 28-32 are patentable over the prior art references and requests the Examiner to reconsider and withdraw the current rejections.

IX . CONCLUSION

The formula recited in claims 7, 28 and 30 is well supported by the specification. Disclosure of the formula for derivation of the redundant portion of each packet is found in the specification and as taught, this value can vary with the observed characteristics of the network and therefore is not a fixed value as presumed by the Examiner. The Examiner's only rejection is based upon improper disclosure. Because applicant has demonstrated herein where the disclosure is clearly found in the specification, the claims should be allowed.

Applicant feels that the invention is unique and that, in the event the Board finds the existing claims to be objectionable for any reason, a fair approach to claims revision would lead to a satisfactory outcome for both Applicant and the PTO. However, failing that scenario, and in view of the foregoing, Appellants submits that claims the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. Thus, the Board is respectfully requested to remove

the rejections of claims 7-10 and 28-32 and pass the present Application to issue.

Respectfully submitted,

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Joseph J. Zito	3-14-07 Date

CLAIMS APPENDIX

CLAIMS ON APPEAL:

7. A method for reducing data loss in the event of packet loss in a modem relay connection over a packet network including a transmitting modem and a transmitting gateway, a receiving modem and a receiving gateway, the method comprising:

providing a packet format including a header portion, a sequence number and a data portion;

dividing said data portion into a plurality of segments; designating one of said segments as a new data segment;

providing sequential blocks of modem data from said transmitting modem to said transmitting gateway;

retaining a predetermined number of sequential blocks of modem data at said transmitting gateway, by dropping the oldest block and retaining the most recent block; providing the most recent block of data in said designated new data segment of said data portion of said packet;

providing the remaining retained blocks of data in the remainder of said segments;

wherein:

each time said transmitting gateway receives a new block of data from said transmitting modem, said oldest block is dropped from said retained set of data,

said new block of data is encoded in the next data packet as the new data block; and

said remaining retained blocks are encoded into said data packet as redundant data blocks;

wherein the redundant data blocks are added by a data redundancy with a repetition count *k*, and

wherein the redundancy is performed as data encoding into each packet, according to the following formula where x is the current packet sequence number, *N* represents data bits corresponding to each packet as the packet is, and

each iteration encodes data bits for the current packet *x* and previous packets into the data length of the current packet, the addition sign signifying grouping the data bits together in a block within the packet for each iteration:

$$[x-j]N + [x-i]N$$

where i = (0 to (k - 1)) and j = (1 to k) and each of the variables *i, j* increase by 1 in each iteration up to *k* levels of iterations that are performed for each packet;

transmitting said packets from said transmitting gateway to said receiving gateway.

8. The method of claim 7, wherein said lost packet recovery at said receiving gateway includes:

receiving said transmitted packets;

reading said sequence numbers of consecutively received packets to determine packet loss, including;

comparing the sequence number of sequentially received packets, and determining the difference in the compared sequence numbers; and providing the redundant data corresponding to data lost during said packet loss, to said receiving modem.

9. The method of claim 8, wherein the number of said retained predetermined number of sequential blocks is re-negotiated when said number of detected missing packets exceeds said retained predetermined number of sequential blocks between the two gateways.

10. The method of claim 9, further including detection of a value of the number of lost packets which exceeds the value of said retained predetermined number of sequential blocks;

said receiving gateway reporting said detection; and

adjusting the redundancy to compensate for increases in packet loss across said packet network.

17. A method for modem relay communication between two users, each using a computing device with a modem connected to a modem relay unit, comprising:

establishing a modem relay network by connecting a first local modem to a first modem relay unit (MRU) and by connecting a second local modem to a second modem relay unit (MRU), the first MRU and the second MRU being connected over a packet network;

transmitting call setup commands from the first MRU to the second MRU by seizing the line, with the first MRU, from the first modem to the first MRU after dialing the second modem from the first modem;

seizing the line, with the second MRU, from the second modem to the second MRU and transmitting an answer tone from the second modem to the second MRU after the second modem answers the call setup commands;

performing a handshake between the first MRU and the second MRU using MRU handshake message packets sending while keeping modem data pumps of each MRU turned off;

performing local handshakes between the first MRU and the first local modem and between the second MRU and the second modem;

after the local handshakes are reported, starting the modem data pumps in each MRU;

establishing the modem relay channel by transmitting and replying to modem relay message packets between the first MRU and the second MRU; and transmitting

data streams between the first and second modems via the first MRU modulating/demodulating a first full duplex data stream between the first modem and the first MRU, packetizing the data stream, transmitting the packetized data stream across the packet network to the second MRU, and modulating/demodulating a second full duplex data stream between the second modem and the second MRU.

18. The method of claim 17, further comprising:

using the same modem connection rates and same compression codecs for transmissions between the first modem and first MRU and between the second modem and the second MRU.

19. The method of claim 17, wherein the transmitting the call setup commands further comprises setting a voice channel in a DSP of the second MRU after receiving the setup commands from the first MRU, and

wherein the performing the handshake between the first MRU and the second MRU further comprises switching the voice channel in the second MRU to a modem relay channel.

20. The method of claim 17, wherein the establishing the modem relay channel comprises transmitting modem relay packets that include an RTP header and time

stamp, a field indicating an MRU protocol version, and a digital field indicating whether the packet is a protocol state packet, a handshake stake packet, or a data packet.

21. The method of claim 17, further comprising:

detecting, at the second MRU determines, if the answer tone from the second modem is a V.25 answer tone with phase reversal present, and if detected, then switching from a voice processing channel to a modem relay processing channel wherein the transmitting the answer tone from the second modem comprises determining.

22. The method of claim 21, further comprising:

detecting if a V.25 answer tone with phase reversal is not present in the answer tone from second modem, and if not detected, then detecting for facsimile relay processing in the answer tone.

23. A system for modem relay communication between two users, each using a computing device with a modem connected to a modem relay unit, comprising

a modem relay network comprising a first local modem connected to a first modem relay unit (MRU) that includes first modem relay DSP and a second local modem connected to a second modem relay unit (MRU) that includes a second modem

relay DSP, the first MRU and the second MRU being connected over a packet network, wherein, the first MRU transmits call setup commands to the second MRU by seizing the line, with the first MRU, from the first modem to the first MRU after dialing the second modem from the first modem,

the second MRU seizes the line to the second modem and the second modem transmits an answer tone to the call setup commands to the second MRU, the first MRU and the second MRU handshake using handshake message packets sending while keeping modem data pumps of each MRU turned off, the first MRU and the first local modem handshake and the second MRU and the second modem handshake,

the DSP in each MRU start the modem data pumps,

the first MRU and the second MRU establish the modem relay channel by transmitting and replying to modem relay message packets between them, and

the first and second modems transmit data streams via the first MRU modulating/demodulating a first full duplex data stream between the first modem and the first MRU, packetizing the data stream, transmitting the packetized data stream across the packet network to the second MRU, and modulating/demodulating a second full duplex data stream between the second modem and the second MRU.

24. The system of claim 23, wherein the first modem and first MRU and the second modem and the second MRU operate using the same modem connection rates and the same compression codecs.

25. The system of claim 23, wherein the DSP of the of the second MRU sets up a voice channel after receiving the setup commands from the first MRU, and after the first MRU and the second MRU handshake, switches the voice channel in the second MRU to a modem relay channel.

26. The system of claim 23, wherein the first MRU and second MRU transmit modem relay packets that include an RTP header and time stamp, a field indicating an MRU protocol version, and a digital field indicating whether the packet is a protocol state packet, a handshake stake packet, or a data packet.

27. The system of claim 26, wherein the second MRU switches from the voice processing channel to the modem relay processing channel if the answer tone from the second modem is a V.25 answer tone with phase reversal.

28. A method for modem relay data redundancy, comprising:

establishing a modem relay transmission between a first modem relay unit (MRU) and a second MRU over a packet network,

wherein the each packet in the transmission between the MRUs is formatted with a sequence number uniquely assigned to each packet;

negotiating a data redundancy repetition count *k* between the first and the second MRUs;

applying a data redundancy to the modem relay transmission,

wherein the redundancy is performed as data encoding into each packet, according to the following formula where x is the current packet sequence number, *N* represents data bits corresponding to each packet as the packet is, and

each iteration encodes data bits for the current packet *x* and previous packets into the data length of the current packet, the addition sign signifying grouping the data bits together in a block within the packet for each iteration:

$$[x-j]N + [x-i]N$$

where i = (0 to (k - 1)) and j = (1 to k) and each of the variables *i, j* increase by 1 in each iteration up to *k* levels of iterations that are performed for each packet.

29. The method of claim 28, wherein each *k* iteration of the data redundancy in each packet encodes together bits of data *N* from a first packet and a second packet paired

together, and

wherein the second packet has the preceding packet sequence number to the first packet in the transmission.

30. A system for modem relay, comprising:

a first modem relay unit (MRU) transmitting packetized data over a packet network to a second MRU;

wherein the first MRU formats each packet in the transmission with a sequence number uniquely assigned to each packet,

the first and the second MRUs negotiate a data redundancy repetition count *k* between the first and the second MRUs,

the first MRU applies a data redundancy to the modem relay transmission,

wherein the redundancy is performed as data encoding into each packet, according to the following formula where x is the current packet sequence number, *N* represents data bits corresponding to each packet as the packet is, and

each iteration encodes data bits for the current packet *x* and previous packets into the data length of the current packet, the addition sign signifying grouping the data bits together in a block within the packet for each iteration:

$$[x-j]N + [x-i]N$$

where i = (0 to (k - 1)) and j = (1 to k) and each of the variables *i, j* increase by 1 in each

iteration up to *k* levels of iterations that are performed for each packet.

31. The system of claim 30, wherein each *k* iteration of the data redundancy in each packet encodes together bits of data *N* from a first packet and a second packet paired together, and

wherein the second packet has the preceding packet sequence number to the first packet in the transmission.

32. The method of claim 7, wherein each *k* iteration of the data redundancy in each packet encodes together bits of data *N* from a first packet and a second packet paired together, and

wherein the second packet has the preceding packet sequence number to the first packet in the transmission.